Lecture within the ANIMATE project

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online lecture on 15th June 2022,
11 a.m.- 1 p.m.

Using impedance measurements to characterize materials and suspensions

https://itm.pcz.pl/animate/index.php

Summary:
Electrical Impedance Spectroscopy, EIS, is a powerful electrical characterization tool that has been progressively applied over the last decades in many domains of physics, chemistry, and biotechnology. Among the many domains of use of EIS, it is worthy to cite materials science, electrochemistry, and devices characterization: besides EIS is considered as an important tool to be applied in the optimization of performance of components and on the investigation of materials and interfaces. It has been also the base under the development of imaging techniques such as Electrical Impedance Tomography.
The basic experimental setup for EIS is composed of an external alternate electrical signal (a current, *i*, or a voltage *v*), typically with sinusoidal shape, that is applied to the under-study device. Through EIS, it is experimentally possible to determine the mechanisms that control the kinetics of the prevailing processes in the material bulk or over the interfaces. The collected data in the frequency domain is fitted by a mathematical model (that corresponds to a chosen equivalent electrical circuit, EEC) for its interpretation and analysis, fundamentally seeking a meaningful physical interpretation.

EIS is also the base for the development of Electrical Tomography technique. Due to its low cost, portability and handling safety (because no harmful radiation is used), Electrical Impedance Tomography exhibits strong potential for use in several academic/industrial areas. It has a simple setup, and offers quick and easy operation, making it robust enough to be used in many industrial situations. With Electrical Tomography, both quantitative and qualitative data regarding multiphase systems can be obtained for modelling purposes. Non-invasive collection of data by electrical tomography enables the reconstruction of cross-section images, providing material distribution profiles in a suspension flowing through a pipe, or information about possible transient events taking place. The resulting conclusions can then be used in processes redesign or control. In some cases of the real-time imaging of industrial processes, electrical tomography is the most appealing technique, due to its simplicity and low cost.

Everyone who wants to participate in this lecture is asked to send an e-mail to andrzej.boguslawski@pcz.pl (A. Boguslawski) before 12th June 2022.